

## FEATURES

- *Guaranteed*  $\pm 4\text{mV}$  initial accuracy LT1004-1.2
- *Guaranteed*  $\pm 20\text{mV}$  accuracy LT1004-2.5
- *Guaranteed*  $10\mu\text{A}$  operating current
- *Guaranteed* temperature performance
- Operates up to  $20\text{mA}$
- Very low dynamic impedance

## APPLICATIONS

- Portable meter references
- Portable test instruments
- Battery operated systems
- Current loop instrumentation

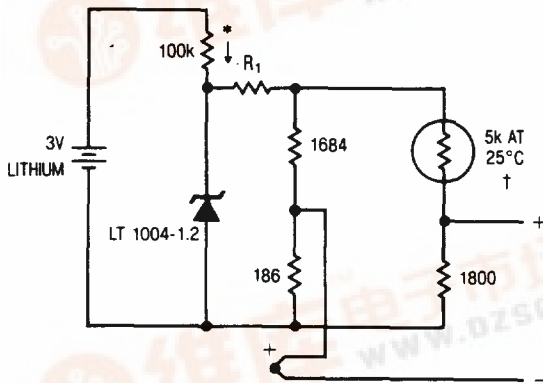
## DESCRIPTION

The LT1004 Micropower Voltage References are two terminal bandgap reference diodes designed to provide high accuracy and excellent temperature characteristics at very low operating currents. Optimization of the key parameters in the design, processing and testing of the device results in accuracy specifications previously attainable only with selected units. Below is a distribution plot of reference voltage for a typical lot of LT1004-1.2. Virtually all of the units fall well within the prescribed limits of  $\pm 4\text{mV}$ .

The LT1004 is a pin for pin replacement for the 385 series of references with improved accuracy specifications. More important, the LT1004 is an attractive device for use in systems where accuracy was previously obtained at the expense of power consumption and trimming.

For a low drift micropower reference with guaranteed temperature coefficient, see the LT1034CS8 data sheet.

### Micropower Cold Junction Compensation For Thermocouples



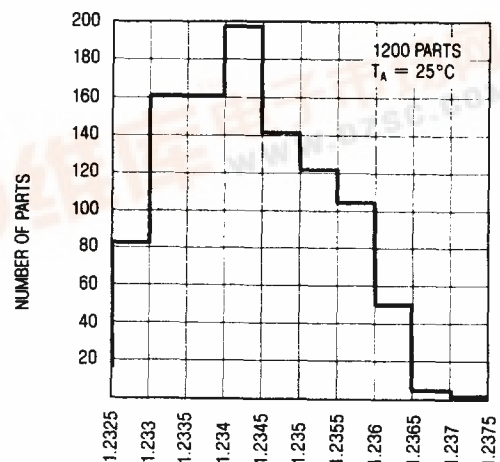
| THERMOCOUPLE TYPE | R <sub>1</sub> |
|-------------------|----------------|
| J                 | 233k           |
| K                 | 299k           |
| T                 | 300k           |
| S                 | 2.1M           |

\* QUIESCENT CURRENT  $\approx 15\mu\text{A}$

† YELLOW SPRINGS INST. CO.  
PART #44007

COMPENSATES WITHIN  
 $\pm 1^\circ\text{C}$  FROM  $0^\circ\text{C}$  TO  $60^\circ\text{C}$

Typical Distribution of  
Reference Voltage (LT1004-1.2)



# LT1004CS8-1.2/ LT1004CS8-2.5

## ABSOLUTE MAXIMUM RATINGS

Reverse Breakdown Current. . . . . 30mA  
 Forward Current. . . . . 10mA  
 Operating Temperature Range . . . . . 0°C to 70°C  
 Storage Temperature Range. . . . . -65°C to 150°C  
 Lead Temperature (Soldering, 10 sec.). . . . . 300°C

## PACKAGE/ORDER INFORMATION

|  |  |
|--|--|
|  | ORDER PART NUMBER                          |
|  | LT1004CS8-1.2<br>LT1004CS8-2.5             |
|  | PART MARKING                               |
|  | 0412 (1.2V VERSION)<br>0425 (2.5V VERSION) |

## ELECTRICAL CHARACTERISTICS (See Note 1)

| SYMBOL                                  | PARAMETER                                     | CONDITIONS   | LT1004-1.2 |       |       | LT1004-2.5 |       |       | UNITS   |
|---|---|--|------------|-------|-------|------------|-------|-------|---------|
|   |   |  | MIN        | TYP   | MAX   | MIN        | TYP   | MAX   |         |
| $V_Z$                                   | Reverse Breakdown Voltage                     | $I_R = 100\mu A$<br>LT1004C $0^\circ C \leq T_A \leq 70^\circ C$ | ● 1.231    | 1.235 | 1.239 | 2.480      | 2.500 | 2.520 | V       |
|   |   |  | 1.225      | 1.235 | 1.245 | 2.470      | 2.500 | 2.530 | V       |
| $\frac{\Delta V_Z}{\Delta \text{Temp}}$ | Average Temperature Coefficient               | $I_{min} \leq I_R \leq 20mA$                                     |            | 20    |       |            | 20    |       | ppm/°C  |
| $I_{min}$                               | Minimum Operating Current                     |  | ● 8        | 10    |       | 12         | 20    |       | μA      |
| $\frac{\Delta V_Z}{\Delta I_R}$         | Reverse Breakdown Voltage Change with Current | $I_{min} \leq I_R \leq 1mA$<br>$1mA \leq I_R \leq 20mA$          | ●          |       | 1     |            |       | 1     | mV      |
|   |   |  | ●          |       | 1.5   |            |       | 1.5   | mV      |
|   |   |  | ●          |       | 10    |            |       | 10    | mV      |
|   |   |  | ●          |       | 20    |            |       | 20    | mV      |
| $r_Z$                                   | Reverse Dynamic Impedance                     | $I_R = 100\mu A$   | ●          | 0.2   | 0.6   | 0.2        | 0.6   |       | Ω       |
|   |   |  | ●          |       | 1.5   |            | 1.5   |       | Ω       |
| $e_n$                                   | Wide Band Noise (RMS)                         | $I_R = 100\mu A$<br>$10Hz \leq f \leq 10kHz$                     |            | 60    |       | 120        |       |       | μV      |
| $\frac{\Delta V_Z}{\Delta \text{Time}}$ | Long Term Stability                           | $I_R = 100\mu A$<br>$T_A = 25^\circ C \pm 0.1^\circ C$           |            | 20    |       | 20         |       |       | ppm/kHr |

The ● denotes the specifications which apply over the full operating temperature range.

**Note 1:** All specifications are for  $T_A = 25^\circ C$  unless otherwise noted.